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REMARKS/ARGUMENTS

Applicant acknowledges the Examiner's review of the specification, claims, and drawings. In light of the above amendments and the remarks that follow, Applicant requests reconsideration of the present application. The amendments and remarks presented herein are fully supported by the application as originally filed. No new matter has been entered.

Status of the Claims

Claims 1-14, 16, and 17 are pending in the application. Claim 15 has been cancelled.

Claim 1 has been amended to more clearly define the invention. Support for the amendment to claim 1 can be found throughout the specification, for example from Figure 2 blocks 216, 218, 220, 222 and the accompanying description from page 17 line 28 to page 18 line 29. Claims 2 to 8 and 12 have been amended for consistency with amended claim 1.

Claim 11 has been amended to more clearly define an aspect of the invention concerning differentiating between upper and lower edges. Support for the amendment can be found from original claim 5 and from the specification at page 17 lines 15 to 25.

New claims 16 and 17 have been added. Support for these claims can be found on page 14 lines 12 to 15 and page 16 line 23 to page 17 line 27.

Claim Rejections 35 USC § 103

With regard to claim 1, Applicant agrees that Kosuge (US 6,571,196) does not disclose an apparatus that determines whether each object edge data component relates to an edge of the object that lies on the work surface or to an edge that is offset above the work surface; or that

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projects each image edge data component onto the object plane to produce a respective object edge data component in the object plane.

However, Applicant respectfully disagrees that the adjustment of object edge data components recited in claim 1 is the same as adjusting the field of view for the camera for the following reasons. To have any affect on a captured image, adjusting the field of view of a camera must take place prior to image capture and it will affect the values of all of the image data components of the captured image. In contrast, the adjustment recited in claim 1 only affects those object edge data components that are deemed to relate to an upper edge of the object, and it can only take place after the image has been captured since, before then, the object edge data components do not exist. As a result, the adjustment recited in claim 1 adjusts the value of some of the captured object edge data components with respect to other object data components. This cannot be achieved by adjusting the field of view of the camera.

To help clarify this, claim 1 has been amended to recite "*only in respect of object edge data components that are determined to relate to an upper edge of the object*, the processing apparatus is arranged to adjust the value of the respective object edge data component by an amount depending on the ratio of the size of said offset in a direction generally perpendicular with the work surface to the perpendicular distance of the camera's focal point from the object plane, *such that said object edge data components that are determined to relate to an upper edge of the object are adjusted with respect to the other object data components produced by said processing apparatus from said single image*" (emphasis added). It is respectfully submitted that Kosuge does not these features and that these features could not be replicated by adjusted the field of view of the camera.

With regard to Bachelder (US 5,974,169), this disclosure is concerned with determining the characteristics of an object represented in an image (col. 1, lines 7-9 and col. 2 lines 16-20). In particular Bachelder discloses a method of identifying the boundaries of an object using

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bounding boxes (col. 2, lines 19-24). As can be seen from all of the relevant figures in Bachelder (i.e. Figures 3A to 3F, 4A to 4H and 5A to 5E and the accompanying description), Bachelder is concerned with identifying two dimensional boundaries in two dimensional image data.

Accordingly, with respect to claim 1, Bachelder does not disclose projecting image edge data components onto the object plane to produce a respective object edge data component. This is because Bachelder does not attempt to generate three dimensional data representing the object and so has no need to do this. The passage of Bachelder referred to by the Examiner in this regard (col. 2, lines 26-29) discloses only a method of labelling boundary points, not projecting image data into the object plane.

Also, because Bachelder does not attempt to, or need to, generate three dimensional data from the two dimensional image data, Bachelder does not disclose determining whether each object edge data component relates to a lower edge of the object that lies on the work surface or to an upper edge of the object that is offset above the work surface by an amount substantially equal to a thickness of the object at said upper edge, as recited in claim 1. Instead, Bachelder only allocates boundary points to edges within a two dimensional space. The passage of Bachelder referred to by the Examiner is this regard (col. 2, line 31-34) only discloses that a boundary point falling outside a boundary box for a given edge is assumed not to form part of said given edge.

Accordingly, neither Kosuge nor Bachelder disclose the following features of claim 1:

the processing apparatus being arranged to project each image edge data component onto the object plane to produce a respective object edge data component in the object plane,

the processing apparatus being further arranged to determine whether each object edge data component relates to a lower edge of the object that lies on the work surface or to an upper

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edge of the object that is offset above the work surface by an amount substantially equal to a thickness of the object at said upper edge,

and wherein, only in respect of object edge data components that are determined to relate to an upper edge of the object, the processing apparatus is arranged to adjust the value of the respective object edge data component by an amount depending on the ratio of the size of said offset in a direction generally perpendicular with the work surface to the perpendicular distance of the camera's focal point from the object plane, such that said object edge data components that are determined to relate to an upper edge of the object are adjusted with respect to the other object data components produced by said processing apparatus from said single image.

The AAPA does not disclose any of the above features either.

It is therefore respectfully submitted that, since neither Kosuge, Bachelder nor the AAPA, disclose any of the features recited above, their combined teachings could not lead the skilled person to the invention of claim 1

Accordingly, Applicant respectfully submits that claim 1 is patentably distinguishable over Kosuge, Bachelder, and the AAPA.

With regard to claims 2 to 4, these claims depend from amended claim 1 and thus incorporate the same limitations of amended Claim 1 and are therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above.

Claims 2 to 4 define how the object edge data components that relate to upper or lower edges are adjusted in situations where an edge profile of the object is perpendicular to the object plane or is undercut or beveled. Applicant respectfully disagrees with the Examiner that Kosuge discloses

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the features of claims 2 to 4. For the same reasons given above in relation to claim 1, adjusting the field of view of the camera, or moving the camera or the stage, cannot replicate the adjustment of object edge data components required by claims 2 to 4. Moreover, the specific amount of the adjustments given in claims 2 to 4 are not disclosed or suggested by Kosuge. With regard to the passage of Bachelder referred to by the Examiner in connection with claims 3 and 4 (col. 4, lines 64-66), as indicated above, the polygonal shape taught by Bachelder is a two dimensional shape in a two dimensional image (Figures 3A to 3F, 4A to 4H and 5A to 5E and the accompanying description), whereas claims 2 to 4 relate to the edge profile of the object in a plane generally perpendicular to the object plane. Bachelder does not disclose an object plane.

Regarding Claim 5, this claim depends from amended claim 1 and thus incorporate the same limitations of amended Claim 1 and are therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above.

Claim 5 recites how the processing apparatus may determine whether or not an object edge data component relates to an upper edge or a lower edge of the object.

The Examiner contends that Bachelder teaches that the processing apparatus determines whether each object edge data component relates to an edge of the object that lies on the work surface or to an edge of the object that is spaced apart from the work surface. The applicant respectfully disagrees. Firstly, as described above in relation to claim 1, the techniques taught by Bachelder are all performed on two dimensional image data and not on the object data components as required by Claim 5 (and as defined in claim 1 on which claim 5 is dependent). Secondly, the "object" disclosed by Bachelder is an object within an image (see Bachelder col. 1, lines 7-9 and col. 2 lines 16-20) and not an object that lies on a work surface. Therefore, Bachelder cannot determine whether any data component relates to an edge of the object that lies on the work surface or to an edge of the object that is spaced apart from the work surface. Thirdly, Bachelder is not concerned with creating three dimensional object data from the two dimensional captured

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image data and does not disclose determining whether or not an object edge data component relates to an edge of the object that lies on the work surface or to an edge of the object that is spaced apart from the work surface.

In connection with the foregoing, it is submitted that the amendments made to claim 5, namely that the processing apparatus is arranged to determine whether said object edge data components relate to a lower edge of the object that lies on the work surface or to an upper edge of the object that is offset above the work surface by an amount substantially equal to a thickness of the object at said upper edge, clarifies the distinction described above.

The Examiner also argues that Bachelder discloses calculating a respective first parameter relating to a notional reference line extending from the object edge data component, calculating a second parameter relating to a notional line extending between the object data component and a reference point in the object plane, and comparing the difference between said first parameter and said second parameter against a threshold value. Applicant respectfully disagrees.

The specific passage of Bachelder (column 9, lines 51 to 63 and steps 48, 50) identified by the Examiner relates specifically to fitting lines 155A to 155D (Figure 5E) to two dimensional boundary points 150 (Figure 5D) that have been determined as edge points. Boundary points that are outside the bounding boxes as shown in Figures 5B and 5C are discarded. It is emphasised that this is an analysis of data representing a two dimensional object in a two dimensional image in order to perform line fitting. This is in contrast to the subject matter of claim 5 which relates specifically to determining whether object edge data components relate to a lower edge of the object that lies on the work surface or to an upper edge of the object that is offset above the work surface by an amount substantially equal to a thickness of the object at said upper edge, clarifies the distinction described above – this relates to three dimensional data of an object on a work surface.

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More specifically, Bachelder does not disclose any of the following other features of Claim 5: calculating a respective first parameter relating to a notional reference line extending from the object edge data component, calculating a second parameter relating to a notional line extending between the object data component and a reference point in the object plane, and comparing the difference between said first parameter and said second parameter against a threshold value, not least because, as described above, Bachelder does not disclose object data components, or an object plane since the "object" disclosed by Bachelder is an object within an image (see Bachelder col. 1, lines 7-9 and col. 2 lines 16-20) and not an object that lies on a work surface.

It is respectfully submitted therefore that the teaching of Bachelder either on its own or in combination with Kosuge and/or the AAPA do not disclose or suggest the combination called for in Claim 5.

Accordingly, Applicant respectfully submits that Claim 5 is patentably distinguishable over Kosuge, Bachelder, and the AAPA.

Regarding Claim 6, the features of this claim are dependent on Claim 5. Claim 6 is therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above.

Further, with regard to the passage of Bachelder identified by the Examiner (columns 8, lines 32 to 46 in Figure 3E) in relation to Claim 6, this states clearly that Bachelder decides that a boundary point in the two dimensional image data corresponds to a top edge of the object (which, as explained above, is a two dimensional object in an image) simply by deciding whether or not it falls into a particular bounding box. Bachelder makes no disclosure of the notional reference lines, first and second parameters, and threshold values comparisons of claim 5 (not least because these are defined in terms of object edge data components and the object plane,

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neither of which are disclosed by Bachelder), or the more specific definition of the first parameter given in claim 6.

Claim 7 depends from claim 1, and claim 8 depends from amended claim 5 and ultimately from amended claim 1; claims 7 and 8 are therefore patentably distinguishable over Kosuge, Bachelder, and Buckley for at least the reasons set forth above.

In addition to the comments made above in relation to claims 5 and 6, Applicant respectfully disagrees with the Examiner that Bachelder discloses said second parameter comprises the value of an angle between the angle reference axis and said notional reference line extending between the object edge data component and said reference point. Bachelder makes no mention of angles or an angle reference axis.

Similar comments apply in relation to claim 8 as are made in relation to claims 5 to 7.

With reference to Claims 9 and 10, Claims 9 and 10 depend from amended Claim 1 and are therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above. Moreover, the respective features of these claims are not disclosed anywhere in Kosuge, Bachelder, or the AAPA.

With regard to Claim 11, Claim 11 has been amended to call for the apparatus to be arranged to determine whether said object edge data components relate to a lower edge of the object that lies on the work surface or to an upper edge of the object that is offset above the work surface by calculating a respective first parameter relating to a notional reference line extending from the respective object edge data component, calculating a second parameter relating to a notional line extending between the respective object edge data component and a reference point in the object plane, and comparing the difference between said first parameter and said second parameter against a threshold value, and dependent on the outcome of said comparison, to determine that

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said respective object edge data component relates to a lower edge or an upper edge of said object.

As acknowledged by the Examiner in relation to claim 5, Kosuge does not disclose these features of claim 11. With regard to Bachelder, as described above in relation to claim 5, the techniques taught by Bachelder are all performed on two dimensional image data and not on the object data components as required by Claim 5 (and as defined in claim 1 on which claim 5 is dependent). Secondly, the "object" disclosed by Bachelder is an object within an image (see Bachelder col. 1, lines 7-9 and col. 2 lines 16-20) and not an object that lies on a work surface. Therefore, Bachelder cannot determine whether any data component relates to an edge of the object that lies on the work surface or to an edge of the object that is spaced apart from the work surface. Thirdly, Bachelder is not concerned with creating three dimensional object data from the two dimensional captured image data and does not disclose determining whether or not an object edge data component relates to an edge of the object that lies on the work surface or to an edge of the object that is spaced apart from the work surface.

Bachelder does not disclose any of the other features of Claim 11, namely calculating a respective first parameter relating to a notional reference line extending from the object edge data component, calculating a second parameter relating to a notional line extending between the object data component and a reference point in the object plane, and comparing the difference between said first parameter and said second parameter against a threshold value, not least because, as described above, Bachelder does not disclose object data components, or an object plane since the "object" disclosed by Bachelder is an object within an image (see Bachelder col. 1, lines 7-9 and col. 2 lines 16-20) and not an object that lies on a work surface.

Accordingly, Applicant respectfully urges that Claim 11 is patentably distinguishable over Kosuge, Bachelder, and Buckley.

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With regard to Claim 12, Claim 12 has been amended similar to Claim 1. Claim 12 and its dependent claim, namely Claim 13, are therefore similarly patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above in reference to Claim 1.

Claim 14 depends from amended claim 1 and is therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above in reference to Claim 1.

Claim 16 depends from amended claim 5 and ultimately from claim 1 and is therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above in reference to claims 1 and 5.

Claim 17 depends from amended claim 11 and is therefore patentably distinguishable over Kosuge, Bachelder, and the AAPA for at least the reasons set forth above in reference to claim 11.

In light of the above amendments and remarks, Applicant respectfully requests reconsideration of the present application and respectfully solicits a Notice of Allowance of all claims. It is respectfully submitted that the application is in order for allowance.

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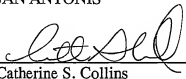
Should the Examiner have any questions or suggestions, she is invited to contact the undersigned at (616) 975-5506 or at collins@vglb.com.

Respectfully submitted,

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